UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/731,168	12/10/2003	Sven Thate	54129	5053

26474 7590 07/28/2009
NOVAK DRUCE DELUCA + QUIGG LLP
1300 EYE STREET NW
SUITE 1000 WEST TOWER
WASHINGTON, DC 20005

EXAMINER	
ONEILL, KARIE AMBER	

ART UNIT	PAPER NUMBER
1795	

MAIL DATE	DELIVERY MODE
07/28/2009	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/731,168	THATE ET AL.	
	Examiner	Art Unit	
	Karie O'Neill	1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *17 April 2009*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-13* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-13* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The Applicant's Remarks filed on April 17, 2009, were received. None of the Claims have been amended. Therefore, Claims 1-13 are pending in this office action.

2. The text of those sections of Title 35, U.S.C. code not included in this action can be found in the prior Office Action issued on December 17, 2008.

Claim Rejections - 35 USC § 102

3. The rejection of Claims 1-11 and 13 under 35 U.S.C. 102(b) as being anticipated by Bradley (US 6,346,182 B1), are maintained. The rejection is repeated below for convenience.

With regard to Claim 1, Bradley discloses a method of fabricating a membrane-electrode assembly (MEA), wherein the MEA comprises a polymer-electrolyte membrane (PEM) of cellulose paper sheets (28), having reaction layers applied to both sides, wherein at least one of the reaction layers includes at least one catalytic component within a liquid (26) and an electron conductor (12), and wherein the method comprises the following steps:

(A) introducing ions of the at least one catalytic component into the polymer-electrolyte membrane (28), this being done by immersing the cellulose sheets (28) into the liquid environment (26) containing the catalyst (column 14 lines 19-34);

(B) applying the electron conductor (12) to one side of the polymer-electrolyte membrane (28) (column 14 lines 19-34);

(C) electrochemically depositing the ions of the catalytic component from the polymer-electrolyte membrane (28), introduced into the reaction layers from the liquid (26) contained in the vessel (24), onto the electron conductor (12) on at least one side of the polymer-electrolyte membrane (28) (column 14 lines 35-57). Bradley does not specifically disclose the electron conductor being applied to "both" sides of the polymer electrolyte membrane, however, a reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. See MPEP 2112. Bradley discloses that the sheets (28) with the electron conductor (12) are stacked and sandwiched between two electrodes (14,16) which anticipates that the electron conductor would then be present on both sides of the membrane (28) if it isn't already. Also, the phrases "particularly for PEM fuel cells" and "optionally having gas diffusion layers" are given little to no patentable weight since the words "particularly" and "optionally" do not make these claim limitations a requirement.

With regard to Claims 2 and 3, Bradley discloses wherein the electrochemical deposition of the ions of the catalytic component in step (C) is carried out under fuel cell conditions and wherein a variation of operating conditions, such as applying a voltage differential between electrodes every fifteen minutes at different intensities, is effected during the deposition under fuel cell conditions (column 14 lines 35-38). Since the clarity of fuel cell conditions has not been established in the claims, it is inherent that the electrochemical deposition takes place under fuel cell conditions since a fuel cell is an

electrochemical cell comprising an anode, a cathode, a membrane and an electric field which is applied to induce an electrochemical reaction.

With regard to Claims 4 and 5, Bradley discloses wherein the electrochemical deposition of the ions of the catalytic component in step (C) is carried out under electrolytic conditions, wherein the electrolytic conditions comprise the application of a constant or time-variant DC voltage or an AC voltage (column 11 lines 54-62 and column 14 lines 35-38).

With regard to Claim 6, Bradley discloses a method of fabricating a membrane-electrode assembly (MEA), wherein the MEA comprises a polymer-electrolyte membrane (PEM) of cellulose paper sheets (28), having reaction layers applied to both sides, wherein at least one of the reaction layers includes at least one catalytic component within a liquid (26) and an electron conductor (12), and wherein the method comprises the following steps:

(A) introducing ions of the at least one catalytic component into the polymer-electrolyte membrane (28), this being done by immersing the cellulose sheets (28) into the liquid environment (26) containing the catalyst (column 14 lines 19-34);

(B) applying the electron conductor (12) to one side of the polymer-electrolyte membrane (28) (column 14 lines 19-34);

(C) electrochemically depositing the ions of the catalytic component from the polymer-electrolyte membrane (28), introduced into the reaction layers from the liquid (26) contained in the vessel (24), onto the electron conductor (12) on at least one side of the polymer-electrolyte membrane (28) (column 14 lines 35-57), wherein in step (C)

at least one element from the 3rd to 14th group of the periodic table of the elements is deposited as the catalytic component onto the electron conductor on at least one side of the polymer- electrolyte membrane (column 9 lines 4-15). Bradley does not specifically disclose the electron conductor being applied to "both" sides of the polymer electrolyte membrane, however, a reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. See MPEP 2112. Bradley discloses that the sheets (28) with the electron conductor (12) are stacked and sandwiched between two electrodes (14,16) which anticipates that the electron conductor would then be present on both sides of the membrane (28) if it isn't already. Also, the phrases "particularly for PEM fuel cells" and "optionally having gas diffusion layers" are given little to no patentable weight since the words "particularly" and "optionally" do not make these claim limitations a requirement.

With regard to Claims 7 and 8, Bradley discloses wherein in step (C) at least one of the elements Pt, Co, Fe, Cr, Mn, Cu, Ru, Pd, Ni, Mo, Sn, Zn, Au, Ag, Rh, or Ir is deposited as the catalytic component on the cathode-side electron conductor and the anode-side electron conductor (column 9 lines 4-15).

With regard to Claim 9, Bradley discloses wherein the electron conductor (12) comprises carbon in the form of graphite or known forms of conductive diamond (column 7 lines 48-54).

With regard to Claim 10, Bradley discloses wherein the electron conductor (12) applied in step (B) comprises at least one catalytic component from the group consisting

of Pt, Co, Fe, Cr, Mn, Cu, V, Ru, Pd, Ni, Mo, Sn, Zn, Au, Ag, Rh, Ir or W (column 7 lines 54-58).

With regard to Claim 11, Bradley discloses wherein in step (B), together with the electron conductor (12), an ion conductor is applied to at least one side of the polymer-electrolyte membrane. The composition of the electrically consecutive particulate (12) may include a conductive form of carbon, a metal, a metal alloy, a conductive metal oxide, a conductive polymer, a conductive organic salt crystal, or mixtures thereof. Examples of the conductive polymer include polypyrrole, polyanaline or polythiophene (column 7 lines 48-61).

With regard to Claim 13, Bradley discloses a method of fabricating a membrane-electrode assembly (MEA), wherein the MEA comprises a polymer-electrolyte membrane (PEM) of cellulose paper sheets (28), having reaction layers applied to both sides, wherein at least one of the reaction layers includes at least one catalytic component within a liquid (26) and an electron conductor (12), and wherein the method comprises the following steps:

(A) introducing ions of the at least one catalytic component into the polymer-electrolyte membrane (28), this being done by immersing the cellulose sheets (28) into the liquid environment (26) containing the catalyst (column 14 lines 19-34);

(B) subsequently, applying the electron conductor (12) to one side of the polymer-electrolyte membrane (28) (column 14 lines 19-34);

(C) electrochemically depositing the ions of the catalytic component from the polymer-electrolyte membrane (28), introduced into the reaction layers from the liquid

(26) contained in the vessel (24), onto the electron conductor (12) on at least one side of the polymer-electrolyte membrane (28) (column 14 lines 35-57). Bradley does not specifically disclose the electron conductor being applied to "both" sides of the polymer electrolyte membrane, however, a reference which is silent about a claimed invention's features is inherently anticipatory if the missing feature is necessarily present in that which is described in the reference. See MPEP 2112. Bradley discloses that the sheets (28) with the electron conductor (12) are stacked and sandwiched between two electrodes (14,16) which anticipates that the electron conductor would then be present on both sides of the membrane (28) if it isn't already. Also, the phrases "particularly for PEM fuel cells" and "optionally having gas diffusion layers" are given little to no patentable weight since the words "particularly" and "optionally" do not make these claim limitations a requirement.

Claim Rejections - 35 USC § 103

4. The rejection of Claim 12 under 35 U.S.C. 103(a) as being unpatentable over Bradley (US 6,346,182 B1), is maintained. The rejection is repeated below for convenience.

Bradley discloses the method of fabricating a membrane electrode assembly in paragraph 6 above, including wherein the catalytic component is in a concentration of about 0.05 mM to about 10 mM (column 9 lines 31-32). Bradley does not disclose wherein in step (A) the catalytic component is introduced into the polymer electrolyte membrane in an amount of from 0.000005 to 0.05 mmol/cm^2. However, it would have

been obvious to one having ordinary skill in the art at the time the invention was made to use catalyst component in an amount of 0.000005 to 0.05 mmol/cm2 so as to allow electrodeposition to occur at a reasonably efficient rate but not so much that the conductivity will be too high to apply the electric field at the intensity or strength desired (column 9 lines 31-37.) It has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. See MPEP 2144.05.

Response to Arguments

5. Applicant's arguments filed April 17, 2009, have been fully considered but they are not persuasive.

Applicant first argues that "Bradley is directed to a catalyst and a method of producing the catalyst. Bradley is not concerned with a method of fabricating an MEA. Bradley provides no apparent reason to assume that the cellulose sheets used as an inert support to provide proper alignment of the electrically conductive particulate substrate with the electric field in order to allow the formation of a catalyst would be useful as a PEM."

Bradley teaches that a cellulose sheet (28) is disposed between an anode electrode (16) and a cathode electrode (14). A reason to assume that the cellulose sheet would be useful as a PEM is not necessarily required since the Bradley reference discloses the cellulose sheet being used as a membrane between the anode and cathode electrodes. Also, polymers are cellulose derivatives, which would make the cellulose sheet a polymer membrane.

Next, Applicant argues that, "Bradley does not describe introducing ions of a catalytic component into a polymer-electrolyte membrane. To the contrary, Bradley describes introducing electrically conductive particulate substrate materials into an electrically nonconductive substrate and subsequently depositing a catalytic substance onto the surface of the electrically conductive particulate substrate." Applicant notes that "a conductive polymer is not necessarily an ionomer".

The claim language does not indicate that catalytic substance cannot be further introduced onto the surface of an electrically conductive particulate substrate. So long as the catalytic component is introduced into a polymer electrolyte membrane, as is disclosed by Bradley when the catalytic substance is deposited onto the cellulose sheets which are made to be conductive substrates, the end product is the same. Applicant notes that a conductive polymer is not necessarily an ionomer. However, it can be. And, further, the claim language recites "introducing ions of at least one catalytic component into the polymer electrolyte membrane and/or into an ionomer". In the instant case, Bradley introduces the catalyst component into the polymer membrane or cellulose sheet.

Applicant argues, "Bradley explicitly states that the electron conductor is dispersed onto only one side of the cellulose paper." Applicants submit that "stacking and sandwiching sheets comprising an electron conductor is not equivalent to applying an electron conductor to both sides of a PEM."

As is indicted in the rejection above, Bradley discloses that the sheets (28) with the electron conductor (12) are stacked and sandwiched between two electrodes

(14,16), which anticipates that the electron conductor would then be present on both sides of the membrane. Stacking and sandwiching sheets containing electron conductor together so that there is intimate contact between the electron conductor and the membrane or cellulose paper, is equivalent to applying the electron conductor to the membrane. The definition of apply is to bring into physical contact with or close proximity to. Thus, Applicant's argument is not persuasive and the reference reads on the claim limitations.

Applicant further argues that, "Bradley does not describe depositing ions of a catalytic component from the polymer-electrolyte membrane onto the electron conductor. To the contrary, Bradley describes electrodepositing from an environmental medium (liquid 26) to the electron conductor (graphite particles). Bradley does not describe depositing ions of a catalytic component from an ionomer introduced into a reaction layer of a PEM onto the electron conductor."

Bradley discloses that when electric fields are applied by imposing a voltage differential between electrodes, Pd^{2+} is liberated, while Pd metal is electrodeposited onto the cathodic region of the substrate. The Pd^{2+} moves through the cellulose sheets in the direction of the anode electrode, and rests on the anode side of the cellulose membrane sheet. While Bradley does not specifically indicate whether or not the catalyst material is depositied onto the anode electrode, it is assumed that the catalyst material on the anode side of the cellulose membrane sheet will adhere to the anode electrode and therefore, introduce the catalyst component from one side of the cellulose

sheet onto the other side of the cellulose sheet that is adhered to the electron conductor.

Applicant argues that "Bradley does not describe any variation in the operating conditions during the deposition."

Bradley discloses in column 14, lines 50-54, that after that electric field has been applied for a sufficient time, application of the potential difference between the electrodes is terminated by switching off the power supply, which removes the electric field. The application and termination of the power supply occurs during the deposition process and constitutes as a variation of operating conditions.

Applicant argues that, "Bradley does not describe depositing a catalytic component on the cathode-side electron conductor."

Bradley discloses in column 14, lines 26-29, the cellulose sheets (28) with the catalyst particles (12) were stacked and sandwiched between the electrodes (14, 16). Applicant's argument is not persuasive since the stacking and sandwiching of the sheets is equivalent to applying the catalyst particles onto the electrodes, both the anode electrode and the cathode electrode.

Finally, Applicant argues that, "the Office action errs by stating, it would have been obvious to use catalyst component in an amount of 0.000005 to 0.05 mmol/cm^2 so as to allow electrodeposition to occur at a reasonably efficient rate but not so much that the conductivity will be too high to apply the electric field at the intensity or strength desired. The cited portion of Bradley describes the concentration of the salt in the

environment (i.e. the liquid 26). Bradley provides no description that would anticipate or obviate the claim 12."

Bradley indicates the presence of the catalytic component in an amount of 0.05mM to about 10mM. Bradley does not indicate the amount of the catalyst that is deposited into the polymer electrolyte membrane, but as indicated in the reference, there is more than an ample amount of the catalytic component present in the liquid to be deposited into the polymer electrolyte in order to allow electrodeposition to occur at a reasonably efficient rate but not so much that the conductivity will be too high to apply the electric field at the intensity or strength desired. If the amount of catalytic component present in the liquid is not enough to achieve an amount of 0.000005 to 0.05mmol/cm^2 to be deposited into the polymer electrolyte membrane, it would be obvious to one of ordinary skill of the art to change the amount of catalyst present in the liquid. As stated before, it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. See MPEP 2144.05.

Conclusion

6. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the

shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Karie O'Neill whose telephone number is (571)272-8614. The examiner can normally be reached on Monday through Friday from 8am to 5pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/PATRICK RYAN/
Supervisory Patent Examiner, Art Unit 1795

Karie O'Neill
Examiner
Art Unit 1795

KAO